# Establishing Choctawhatchee Sand Pine Using Strip Site Preparation

**Kenneth W. Outcalt,** *Southeastern Forest Experiment Station, USDA Forest Service, Gainesville, FL 32611.*

*ABSTRACT. A long-term (>10 yr) study in the Georgia sandhills shows that strip site preparation is benefit–cost effective in establishing Choctawhatchee sand pine* (Pinus clausa *var.* immuginata *D. B. Ward) plantations. Costs can be reduced without detriment to survival or stand yield.*

*South. J. Appl. For. 12(3):178–181.*

Choctawhatchee sand pine (*Pinus clausa* var. *immuginata* D. B. Ward) will grow better than other pine species on the droughty, infertile sandhills soils of northwest Florida (Brendemuehl 1981) and Georgia (Hebb 1982). Most of these sandhill sites were once dominated by longleaf pine (*Pinus palustris* Mill.), but are now covered with low-quality hardwoods. Double chopping, effective for reducing hardwood competition and encouraging planted sand pine growth (Burns and Hebb 1972), has been used extensively for conversion of scrub hardwood stands to sand pine plantations.

Although reduction of hardwood competition before planting Choctawhatchee sand pine is beneficial, it is not necessary for successful establishment. Sand pine can be successfully underplanted on sandhills sites with good survival (Hebb and Burns 1973, Outcalt and Brendemuehl 1984). Eventually the sand pine will overtop the hardwood competition and dominate the site.



Reprinted from the *Southern Journal of Applied Forestry* Vol. 12, No. 3, August 1988

Growth, however, is reduced considerably for trees on nonprepared areas compared to trees on sites chopped before planting. The purpose of this study was to determine (1) if *strip* site preparation could reduce establishment costs without significantly reducing growth rates, and (2) the effect of strip width on costs and tree growth.

## METHODS

This study was installed on sandhills sites at two locations in Marion County, GA. Both sites had Lakeland soil (thermic, coated, Typic Quartzipsamment) that was underlain by a sandy clay layer at 7 to 9 ft. At each location there were four replications of each treatment in a completely randomized design. The four treatments consisted of different combinations of site preparation and planting configuration. Site preparation consisted of KG-blading or chopping and disking. The KG-blading and chopping were done in July 1972, and the disking was done the following October. The 1-0 Choctawhatchee sand pine seedlings were planted at one location in February 1973 and at the other in February 1974.

One treatment served as a type of control, with site preparation and planting done in a single operation. A 6-ft wide, V-shaped blade mounted on the front of the tractor pulling the planting machine was used to sever vegetation at the ground-line. An 8-ft strip of hardwood scrub was left between the 6-ft planting strips. Tree seedlings were planted 6 ft apart in a single row in the center of each cleared strip. The same tractor with V-blade and Beloit-type planting machine, with planting foot extended 4 in., was used to plant all other treatments. Site preparation for the second and third treatments was done with a 10-ft-wide KG-blade mounted on the front of a tractor. Two passes of the blade cleared strips about 20-ft wide. Treatment 2 like treatment 1, used an intervening leave strip 8-ft wide, but treatment 3 was installed with 16-ft strips of rough between treated areas. In treatment 2, two rows 14 ft apart were planted, with trees about 6 ft apart in the row, while in treatment 3, 3 rows on 9-ft centers were used, with trees spaced at 7 ft within the rows. In treatment 4, a 7-ft Marden single-drum chopper made two passes to clear a 10-ft-wide strip. Later, this strip received a single pass from a 10-ft Rome disk harrow. Trees were planted in the strips 7 ft apart in 2 rows 8 ft apart. Leave strips in this treatment were 14-ft wide. All treatments resulted in a planting density of 519 trees/ac, with an average spacing of 6 by 14 ft in treatments 1 and 2, and 7 by 12 ft in treatments 3 and 4.

A time record was kept for each of the site preparation and planting operations. Seedling survival was assessed at ages 1, 3, and 5 years in each treatment on measurement plots consisting of three rows of trees with 50 planting spots in each. The 1973 plantation was destroyed by a wildfire at age 10 years. Tree diameters and heights were measured on each treatment plot in the 1974 plantation 11 years after planting. Analysis of variance was used to test for significant differences in survival, growth, and yield resulting from treatments.

## RESULTS AND DISCUSSION

The V-blade strips on 14-ft centers and the chop and disk strips on 24-ft centers both resulted in treating less than half of the area (Table 1). Because the strips were wider, more of the KG-bladed area was treated, especially in treatment 2 where these 20-ft strips were done on 28-ft centers. The chop and disk treatment took the longest to do because two passes had to be made. Site preparation by KG-blading took slightly longer in treatment 2 than in treatment 3 because more of the total area had to be covered. Planting time was essentially equal for all treatments. Thus, the lack of prior site preparation did not appreciably slow the planting operation on V-blade treatments. If site preparation had been used, the cost of establishing seedlings would have been about 2.5 times more. Although chop and disk took longer, their cost was about the same as that of the KG-blade methods, both because disking is a less costly operation and because less of the actual area was site prepared. It should be noted that time estimates are conservative compared to what could be expected for larger operations. They are mainly useful for comparing treatments.

The initial survival was much better for the seedlings on all treatments in the second plantation (Table 2). This was attributed to three factors: The quality of the planting stock, the amount of rainfall during and after the planting season, and the time for soil settling prior to planting. The seedlings used in the 1973 planting had not been hardened-

**Table 1. Proportion of area prepared, time, and cost of strip site preparation and planting, by treatment method.**

| Treatment method | Area treated | Time to:[a] Site prep | Time to:[a] Machine plant | Time to:[a] Total | Cost of: Site prep[b] | Cost of: Machine plant[c] | Cost of: Total |
|---|---|---|---|---|---|---|---|
| | (%) | (minutes/ac) | | | ($/ac) | | |
| V-blade | 43 | 0 | 18 | 18 | 0 | 25 | 25 |
| KG-blade (2 row)[d] | 71 | 61 | 17 | 78 | 44 | 25 | 69 |
| KG-blade (3 row)[d] | 55 | 48 | 22 | 70 | 34 | 25 | 59 |
| Chop & disk | 42 | 128 | 20 | 148 | 42 | 25 | 67 |

[a] Time rates are based on the total land area involved and not just the treated portion.
[b] Cost data from Straka and Watson (1985) was multiplied by the percentage of the area site prepared to give the cost/ac of total land involved.
[c] Calculated by multiplying the number of seedlings planted/ac by the cost to plant a seedling given by Straka and Watson (1985).
[d] Number of rows of trees planted in each strip.

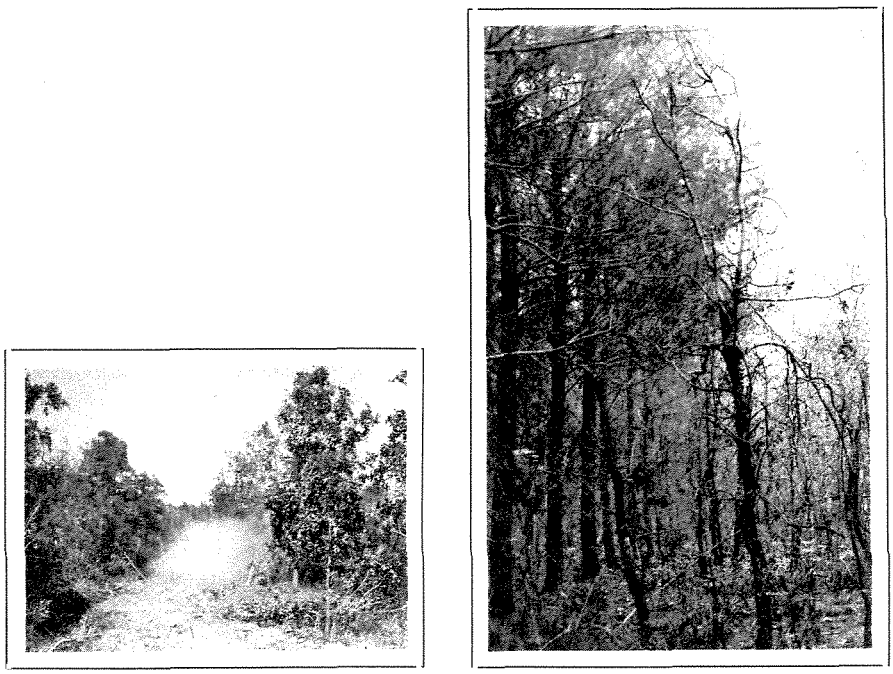

*Figure 1. (a) Strip site preparation in Georgia sandhill infertile site dominated by low-quality hardwoods. (b) Choctawhatchee sand pine trees at age 11 planted on strips similar to that created in photo (a).*

off properly and were more succulent than those used in 1974. The weather in 1973 was drier than in 1974, when 1.6 in. of rainfall occurred during the planting operation. The KG-blading, disking, and chopping were done on both sites during the summer of 1972, which gave the 1974 plantation an extra year for soil settling. In the 1974 plantation there was no difference in survival resulting from the site preparation method. In contrast, it appears that for the 1973 plantation, less soil disturbance improved survival. Although this finding is not statistically significant, it demonstrates the need for a time lag between site preparation and planting to allow the soil to properly settle.

Survival through age 11 years appeared to be a little better on the KG-blade and on the chop and disk treatments than it was on the V-blade treatment, but the difference is not significant (Table 3). Greater mortality might be expected on the V-blade strips due to greater competition as a result of the limited impact of the site preparation treatment and the narrower strips. Still, the V-blade treatment resulted in a well-stocked stand, with 425 trees/ac.

There were no significant differences in tree diameters and heights or in total stem volume/ac between any treatments. Partial shading from taller adjacent competition evidently does not significantly reduce the growth of Choctawhatchee sand pine, since trees on all treatments were very near the average height of 25 ft expected for 11-year-old Choctawhatchee sand pine growing in Georgia (Outcalt and Brendemuehl 1985). This is further substantiated by the lack of a difference in average diameter or height between edge- and center-grown trees in the KG-blade strips planted with 3 rows of trees. In fact, center-grown trees averaged slightly smaller, with a diameter of 3.75 in. and a height of 22.5 ft compared to 3.91 in. and 24.0 ft, respectively, for edge trees. This indicates that displacement of nutrients from site preparation is more of a detriment to growth and yield on this soil series than is incomplete eradication of competing vegetation.

Overall, the minimal treatment, where a V-blade was used on the tractor pulling the planting machine, performed best. This system was much cheaper because no site preparation costs were incurred. Although survival may be somewhat less than with other treatments, nevertheless a well-stocked stand was established. Density can affect yields of Choctawhatchee sand pine (Outcalt 1986), but the effect should be small, as demonstrated by the finding that the treatment with the highest survival, the chop and disk, only had 42 more trees/ac. In addition, the trees on the V-blade strips were just as large as on the sites receiving more intensive and more expensive treatments.

This study shows that good stands of Choctawhatchee sand pine can be established on partially treated scrub hardwood sites. Because the entire area does not have to be treated, this reforestation approach is less expensive than conventional practices. The

**Table 2. Survival of Choctawhatchee sand pine planted on strips made by different site preparation treatments on Georgia sandhills.**

| | Survival[a] | | | |
|---|---|---|---|---|
| Plantation age | V blade (1 row)[b] | KG-blade (2 rows)[b] | KG-blade (3 rows)[b] | Chop & disk (2 rows)[b] |
| year | ..... (%) ..... | | | |
| | 1973 plantation | | | |
| 1 | 72 | 63 | 59 | 57 |
| 3 | 71 | 62 | 58 | 53 |
| 5 | 70 | 62 | 57 | 53 |
| | 1974 plantation | | | |
| 1 | 94 | 95 | 94 | 95 |
| 3 | 90 | 91 | 91 | 94 |
| 5 | 87 | 91 | 91 | 92 |

[a] There were no significant differences between treatments in the 1974 and the 1973 plantation.
[b] Number of rows of trees planted in each strip.

**Table 3. Survival, diameter, height, and yield of Choctawhatchee sand pine at age 11 years planted on Georgia sandhills in strips made with different site preparation equipment.**

| Site preparation[a] | Rows/strip | Survival (%) | Diameter (in.) | Height (ft) | Volume[b] ($ft^3$/ac) |
|---|---|---|---|---|---|
| V-blade | 1 | 82 | 4.1 | 23.4 | 495 |
| KG-blade | 2 | 88 | 4.1 | 23.7 | 530 |
| KG-blade | 3 | 87 | 3.9 | 23.5 | 465 |
| Chop & disk | 2 | 90 | 4.2 | 24.7 | 575 |

[a] There were no significant differences between site preparations for survival, growth, or yield.
[b] Stem volume outside bark to a 1-in. top.

growth rate of trees on strips at age 11 years appears to be the same as for trees on sites receiving complete site preparation. In addition, the leave strips preserve a source of mast and other wildlife foods while the strip configuration creates an edge, providing more potential for wildlife production.

Strip site preparation is not suited to every landowner, but it is a viable alternative for some. A similar approach, on selected sites, may be appropriate for other species of southern pine. □

## Literature Cited


BRENDEMUEHL, R. H. 1981. Options for management of sandhill forest land. South. J. Appl. For. 5:216–222.

BURNS, R. M., AND E. A. HEBB. 1972. Site preparation and reforestation of droughty, acid sands. USDA For. Serv. Agric. Handb. 426. 61 p.

HEBB, E. A. 1982. Sand pine performs well in the Georgia-Carolina sandhills. South. J. Appl. For. 6:144–147.

HEBB, E. A., AND R. M. BURNS. 1973. Methods and goals in preparing sand pine sites. P. 82–92 *in* Proc. Sand Pine Symp. USDA For. Serv. Gen. Tech. Rep. SE-2.

OUTCALT, K. W. 1986. Stand density affects growth of Choctawhatchee sand pine. South. J. Appl. For. 10:128–131.

OUTCALT, K. W., AND R. H. BRENDEMUEHL. 1984. Sand pine survival and growth on prepared and unprepared sites. South. J. Appl. For. 8:96–99.

OUTCALT, K. W., AND R. H. BRENDEMUEHL. 1985. Growth of Choctawhatchee sand pine plantations in Georgia. South. J. Appl. For. 9:62–64.

STRAKA, T. J., AND W. F. WATSON. 1985. Costs of forestry practices. For. Farmer Man. 44:16–22.